

ifp Excursion 2014

IGI Company, Kreuztal – Leica Camera, Wetzlar

Organized by ifp for
GeoEngine Master Students (2nd semester) and
Geodäsie & Geoinformatik Bachelor students (6th semester)

26.06.2014 – 27.06.2014



This excursion was organized by the Institute for Photogrammetry in order to introduce us (students from international and German program) two companies, IGI - company and Leica Camera, where these companies deal with the development of photogrammetry and laser scanning techniques. The excursion also contained tour around the city of Wetzlar – city of optic.

The excursion was held in 2 days (26.06 – 27.06.2014) with IGI – company as the first destination. This company gives mostly a service on street and aerial mapping which gives us an overview and general idea of how the development of mapping works in Germany. Apart from the interesting presentations they even showed us some simulation of the street mapper as well as a peek of the gyrocopter. On the second day we went to Leica Camera and also the city of Wetzlar. Leica Camera produces a wide range types of camera, which are used in many purposes. There we could see the assembly of parts of every Leica camera. They showed us not only all types and sizes of camera but also high end cameras which they just produced. This gave us an insight of the development of cameras from the manufacturer itself.

After a break we had tour through the city of Wetzlar. The tour was started at the place where the basic principles of photogrammetry was developed by Albrecht Meydenbauer. The tour around the city opened our minds to the culture, influence and improvement to the city by the many companies of optics. The following description is the detail about our journey in these 2 exciting days.

IGI Company - Kreuztal

Company Presentation

IGI mbH is a leading company in the photogrammetry field. This company which is based in Kreuztal, Germany was founded in 1978. This company mainly focuses on managing the airborne sensor systems for flight guidance, sensor control using GNSS (Global Navigation Satellite System) and INS (Inertial Navigation Systems). They offer a worldwide technical support to their customers including the Antarctica. Company support and sales are from the headquarters itself and also from their partnering company from all over the world.



Figure 1, Prof. Fritsch and Dr. Kremer (IGI, head of technical development) discussing on the IGI Railmapper mobile mapping system, one of the IGI Company products

This company provides various product and expertise such as their well-known mission planning software IGIPlan. This software is the state-of-the-art mission planning software. It has a worldwide coordinate system support, advanced sensor support for analog and digital aerial cameras, LiDAR and online scanners. It is also combined with CCNS, where flights can be planned and flown in one workflow. Another good product by this company is the Computer Controlled Navigation System - CCNS which is one of the leading systems for aircraft guidance today. AEROcontrol and TERRAcontrol are other products by the company. It is a DGNSS/IMU system for precise determination of position and attitude of various sensors. DigiCAM is a Modular Aerial Camera System for professional, but affordable digital aerial photography. Complementing the DigiCAM family is the system for professional airborne thermography named DigiTHERM, featuring a pixel resolution of 640x480 or even 1240x480 in the Dual DigiTHERM setup. Other systems introduced by the company are for the mobile mapping product. It includes the LiteMapper, RailMapper and also StreetMapper. This product is for the mapping purposes which relates to 3D laser mapping. It has been widely used by their customers for various purposes.

Railmapper

IGI Company offers a new rail mapping system. This system is applicable for clearance measurement, sign detection, new construction, refurbishment and monitoring rails and tunnels.

Using the very latest laser scanning technology, precision navigation and advanced data processing coupled with innovative system design, RailMapper delivers proven accuracies in the most challenging environment.

Application sample images:

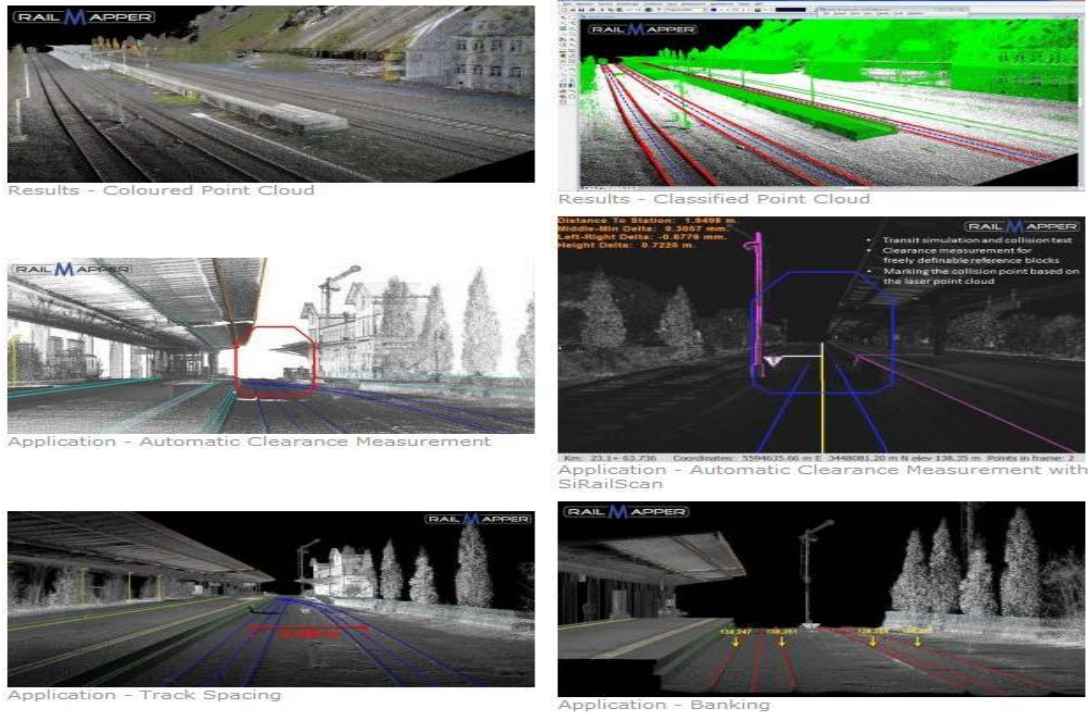


Figure 2, Software Interface of Mapper in Real Time

The RailMapper is oriented onto the tracks of the rail and aligned accurately with the help of video cameras fixed at the four rubber wheels.

RailMapper offers a 360- degree field of view with different sensor options. RailMapper can be operated on speeds above 100 km/h and is a complete system solution with established workflow. The system can be equipped with different types of laser scanners which differ in precision and range. A typical solution comprises of 2 to 3 scanners to get the best possible results. In addition different kind of RGB and video cameras for integration are available.

The onboard navigation system includes a GNSS receiver, a fiber optic gyro-based Inertial Measurement Unit and the latest Direct Inertial Aiding Plus (DIA+) to assist in areas of poor GPS/GLONASS reception. Laser scanners have rotating wheels of frequency 200 Hz and IMU can measure movements with 500KHz.

The equipment is supported by power supply and installed in specific designed car, which also has possibility to go on rail. For the stability of the equipment, they are fixed with special mounts with screws. In order to get very high density data coverage a speed of 20 km/h is required. These data afterward can be used for monitoring, refurbishment and new construction design. With the on board screen, the device can be monitored with its various functions.



Figure 3, Railmapper after railing on the track



Figure 4, The Rail Mapper Measurements equipment on the roof of the two-way-vehicle

Gyrocopter with Lite Mapper

One of the IGI products is the Gyrocopter Lite Mapper, about which we had an interesting presentation in Kreuztal.

This product is designed to be in between a normal aircraft and a UAV, due to the fact that the main purpose is to cover surfaces which are too big for a normal UAV and for which the price will be too high by using a big aircraft.

Main characteristics:

- Manned aerial system
- Velocity: 145 km/h
- Price area: 90000 euro
- Fuel consumption: 18 l/h
- Fuel capacity: 100 l
- Pay load: 180-290 kg
- Takeoff and landing: 200 m.

On this gyrocopter we can implement three different configurations, for the use of:

- Photogrammetry
- Airborne laser-scanning
- 3D city modelling.

System components:

- Inertial navigation system (IMU combined with GPS)
- AERO control + Digi control
- CCNS -5 (computer control navigation system)
- GPS antenna
- Laser scanner.

Concerning the mission planning, we had a presentation from one of the IGI's engineers. He showed us some examples about how to use the software, regarding the mission planning. For this he used the *IGI plan*, a software developed by their company. The concept of the company is to provide to its customers all necessary tools, starting from planning a mission, collecting the data and processing, up to delivering the final product. All the system components are very flexible and can be adapted to the customer's wishes.



Figure 5, The Gyrocopter cockpit with IGI mobile mapping equipment.



Figure 6, Students in front of Gyrocopter

Gathering at Youth Hostel

Our Youth Hostel, the Freusburg, is a really extraordinary place to stay in it, because of his history and the place. Actually, this was a castle which was turned into a hostel with a breathtaking view over the surrounding hills.



Figure 7, on our way to the Hostel



Figure 8, Under the gate of the Hostel



Figure 9 Path inside the area of the Hostel

After we settled in our rooms, we watched the FIFA World Cup football game between Germany and USA. It was quite interesting for us to see our professors giving their support to German national football team with plenty of emotions, fears and excitement.



Figure 10, German and International Students together with Professors are watching the Game. Germany won 1:0!

After the dinner and the amazing presentations about Albrecht Maydenbauer's life, hold by the founder of the IGI company professor Albrecht Grimm, we had a rare opportunity to discuss with our professors about the science and daily topics out of the class, enjoying the taste of well-known beer from this part of Germany.



Figure 11 While having dinner

History of Photogrammetry

The first day was coming to its end and everyone was enjoying the dinner in the youth hostel. However, this day had to close in a very nice way. And that happened!! Professor Albrecht Grimm made a very tantalizing and inspiring speech about the history of photogrammetry and its first scientific ancestor Albrecht Meydenbauer. Meydenbauer (1834-1921) was a German civil engineer studied in Berlin and the inventor of the science of photogrammetry. He managed to take 20000 images from several structures, mainly cathedrals and other historic monuments. These images were taken in Moscow during the Second World War and were given back to Germany at a later date. Professor Grimm explained that Meydenbauer's area of interest was not only Germany, but he travelled a lot and captured images of many different places.

Except for the history of the first photogrammetrist, we had the chance to learn some important stuff about the history of this science. The first time that the terminus photogrammetry was used, was in 1867. Until 1920, 2500 architectures were pictured. In addition we learned that the first camera was using the wet photographic procedure, invented in 1850. Later, in 1865 Foucade invented the stereoscopy which is one of the basic principles of photogrammetry even today. Moreover, one lens from 1867 with 90° opening angle and another one from 1900 with 130° were showed to the students. It was amazing to see the big difference with the new up-to-date lenses.

Finally the last part of this exhibition was to make questions to Professor Grimm about photogrammetry and what's his feeling about the science's future. It was really significant for the students to hear all this information and points of view from the founder and head of IGI company. As the night was coming to an end, different opinions were presented and for sure from this discussion with Professor Grimm, there were many things that students had to consider.



Figure 12, Presentation of Prof. Albrecht Grimm (founder of IGI company) on the early history of photogrammetry in Germany.



Figure 13, Albrecht Meydenbauer, who invented the photogrammetry in 1858, while surveying the Wetzlar cathedral



Figure 14, One of the very early lenses, used in Albrecht Meydenbauer's photogrammetric cameras

LEICA camera - Wetzlar

Camera Manufacturing

Herzlich willkommen! This is the way how the Leica Camera Company welcomed us. Being back to the city of Wetzlar only one month ago, the company celebrated 100 year of Leica Photography in their new location. During these 100 years, famous photographers from all over around the world have been capturing once-in-a-lifetime moments with their Leica camera.

Beside the amazing exposition, we had an overview of the products which made “the Legend to live on”.



Figure 15, The impressive Leica Camera main entrance



Figure 16, Exhibitions in Leica

The windows inside the production gave us a feeling about the necessary environment conditions and about the workers' abilities, needed in order to obtain a high quality product. At the end of this tour, we agreed to the company's motto: "they don't just build cameras – they create everlasting values that set standards".



Figure 17, Optics at Work in the brand new Leica camera facilities Wetzlar

Image Composition, also a Matter of Sensor Size

Dr. Peter Karbe made a presentation about image composition and comparison between different Leica camera systems. There are four main camera systems in Leica, which is S system, M system, system and the latest system.

A significant property for camera is the light transmittance value that is the quantity of the whole light the lens transmit from object to the sensor for different formats, G is described as follows:

$$G = \pi \cdot \frac{1}{(2 \cdot k)^2} \cdot \text{sensor area}$$

Since sensor area is equivalent to the area of image circle, the light transmittance value is proportional to the area factor $1: q^2$.

There is also a relationship between depth of focus df and format factor q :

$$df_{\text{sensor}} \approx q \cdot df_{35\text{mm}}$$

In this case, equivalent f-number is identical with light transmission value and f-number will reflect the 3D properties of photos.

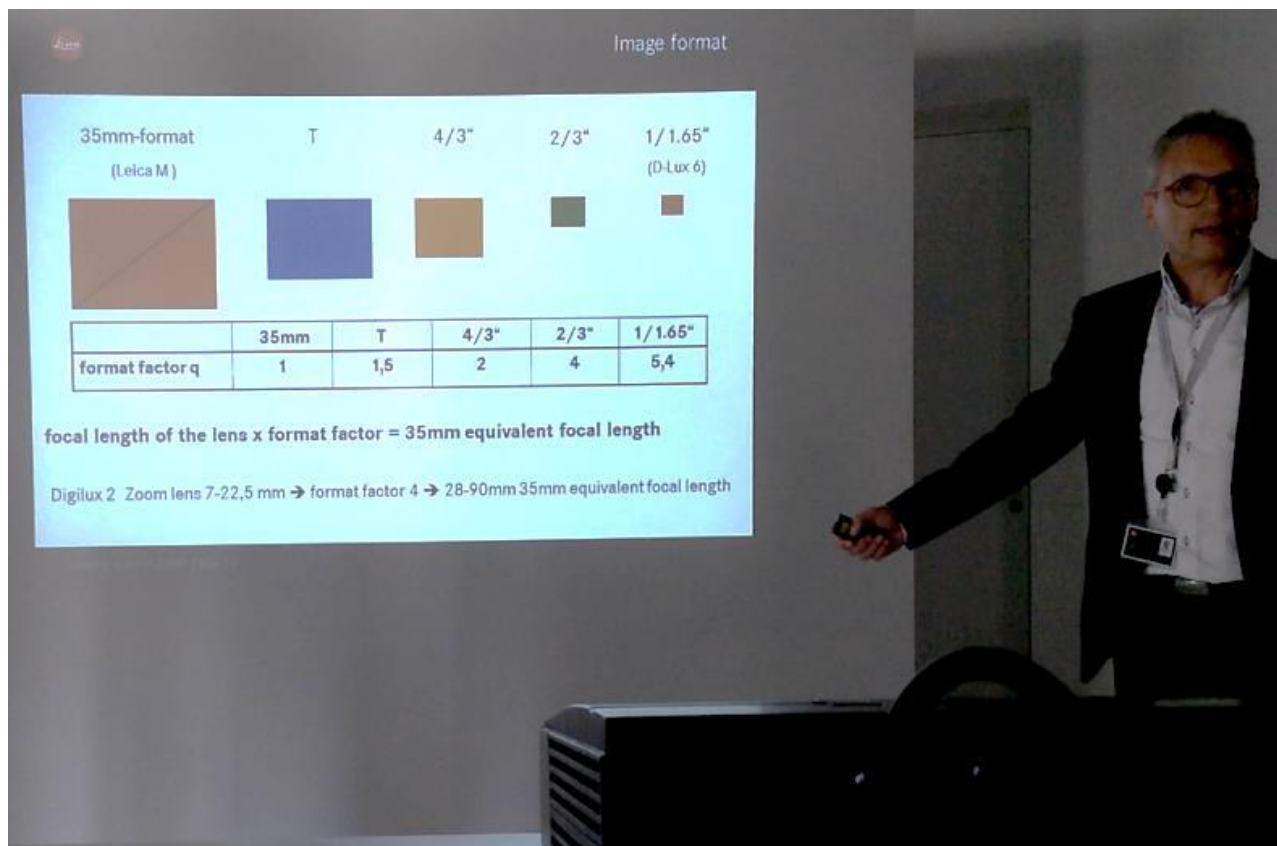


Figure 18, Dr. Peter Karbe, head of the Leica Camera Optics Department, presenting on the design of Leica Cameras and illustrating the influence of Format Factor q on the image quality.

In the last, Mr.Karbe shows some photos taken by Leica camera containing 3D information, all of the pictures made a deep impression on us.

Camera and Lenses of Leica

As we know, for 100 years Leica has been the icon of photographic imagery. Before they had a dream that they can bring what they loved about their photography into the world of moving pictures. The dream came true when Leica Cine Lenses were born. CW Sonderoptic GmbH, designer and manufacturer of Leica Cine Lenses. The main concept of design is to give an essential look for motion pictures, innovate with a new level of performance and create the best lenses. Less then three years later, the Leica Summilux- lenses were the first released, they came true their dream. So now it is widely used for some of the biggest feature film projects with some of the most talented actors and actresses in the world, for example, Transformers 4(2014), Iron Man 3(2013). It also presents a successful marketing policy of Leica.

The staff also introduced us a high perform camera called 'Sinar P3' which comes from Sinar Company that is took over by Leica. The Sinar View Camera with its versatile accessory modules produces an image quality of highest level. It provides professional performance without compromises, creative composition as well as true to original reproductions, all of this within a clearly defined work-flow. Sinar is the leader in manufacturing of precision view cameras for more than 60 years.

The Sinar corresponds to the highest camera precision 'Made in Switzerland', including ergonomic design and unlimited creative freedom. In the photography field, the Sinar View Camera is a superstar; the directors prefer it very much. Now Leica has possessed the products from low-end to highpoints.



Figure 19, Some of the students are taking interest in Leica's Product



Figure 20, High Performance Camera 'sinar P3'

Wetzlar – historical city and one center of optical industries

The final stop of our wonderful journey was a guided tour of the beautiful city. The city is known not only as the place where Photogrammetry was born, but also in the field of optic where they have optic parcours all over the city.

Wetzlar attracted many to settle in and around the city. From this point, we were brought around the old city of Wetzlar. During this tour, we were told by the guide tour about the history of this old town which developed with the growing optic companies. We get the chance to enter the old cathedral that keeps a lot of history.



Figure 21, Our group in front of Cathedral of Wetzlar, a very historic place. The inset shows Meydenbauer's historic photograph, where he exactly marked the place on the tower where he almost fall. This was the reason why he invented photogrammetry

Also, we were then go for the ‘*Optik Parcours*’ tour. As we know, Wetzlar is very famous as an optic city. There are quite numbers of world-famous optical companies which are originated from this old town. Some of the well-known companies are Leitz (Leica), Hensoldt (Zeiss) and Minox. Apart from that, the Wetzlar town is also known with the mining industries. This makes the town as an industrial town. The iron ore found in the Lahn-Dill area. We also got to see the old Lahnbridge which cross the Lahn River. Some of the ‘*Optik Parcours*’ point that we visited are the ‘Water/Light Organ’. The water organ is an artful water game combining the lights and sound. This is very interesting as it takes the audience into the imagination. Other than that, we also visit the ‘Beuchet-Chair’. Here is where it plays with our viewing perspective. We can see how the proportion of two people with difference distance will appear from the viewing point. Also, we visit other points such as the ‘Optokinetic Balance’, ‘Stereo Microscopic’, ‘Cross Mirror’ and ‘Ames Room’. In conclusion, the guided tour around the old town of Wetzlar was very interesting and unforgettable moment. Geoengine learnt a lot from this tour to integrate theoretical study with the surrounding society.



Figure 22, Starting the tour with our guide.



Figure 23, “Where am I?”



Figure 24, Illusion of the Optik Parcours: The Beuchet Chair



Figure 25, One out of two?



Figure 26, Lucky students enjoying the City of Optic Wetzlar, at the end of a great tour!

Back to Stuttgart

On our way home, which was as interesting as the rest of the trip, we were trying to sing the songs in different languages. At the end, with a lot of practice, we learnt a beautiful song from Ghana which somehow became an anthem of this unforgettable trip.